# The Scientific Method

And the watermelon lab

What is the scientific method?

- It is a step by step procedure of scientific problem solving.
- Similar to a recipe for science.
- The scientific method is a process used to systematically investigate observations, solve problems, and test hypotheses.
- The scientific method helps scientists ensure that the theories they test are true by testing a hypotheses with tests.

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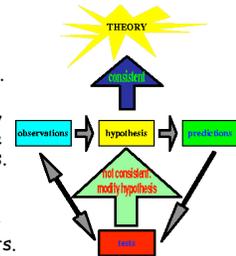
1. Problem/Research Question

- A problem is a question to be considered, solved or answered.
- Everybody constantly encounters minor problems everyday. Most days start with the question, "Should I get out of bed or not?" That is a problem.
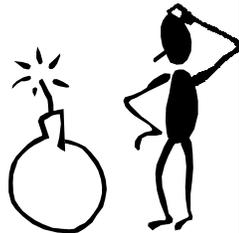
For your watermelon experiment

- What do you want to know/explain?
- Why?
- How?
- What?
- What question is to be solved?
- REMEMBER: This must be something measurable.

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2. Hypothesis

- It is a prediction about the relationship between variables which can be tested.

- The hypothesis is formed by examining the observations carefully and making a an educated guess as to what the outcome might be.

For your watermelon experiment Hypothesis:

- What do you think will happen?
- This is a prediction with a NUMBER result.
- Use **If - then** statements:
- If _____ [*I do this*],
- then _____ [*this will happen*]

3. What are variables?

Or what changes during experiments….

Independent Variables

- The independent variable is the one condition that you change in an experiment.

- *Example:* In an experiment measuring the effect of temperature on solubility, the independent variable is temperature.

Dependent Variable

- The dependent variable is the variable that you measure or observe.
- This is the change that is *dependent* on the state of the independent variable.

- *Example:* In the experiment measuring the effect of temperature on solubility, solubility would be the dependent variable.

Controlled Variables

- A controlled variable or constant variable is a variable that does not change during an experiment.
- This is what is kept the same for ALL of the experiments

For your watermelon experiment Variables/controls:

- What is your independent variable:
- What is you dependent variable:
- What is your controlled variable or your "controls":

4. Experiment

- The fourth step of the scientific method is to do an experiment that tests the hypothesis.
- It answers scientific question by testing a hypothesis using a series of carefully controlled steps called a procedure.
- An Experiment will produce data that will be recorded and then analyzed using data tables & graphs

What are your GOALS for the watermelon experiment?

- Complete a,b,c & d on your handout
- PLUS list your procedures, which are a step by step of what you are going to do, and how you are going to do it.
- Be sure to number these steps.
- Also include any safety gear you'll need to use or bring

5. Observations & Results

- An observation is the act of noting and recording something with instruments.
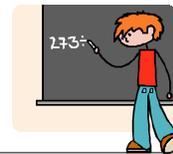- Observations help scientists decide how certain variables might affect the problem.
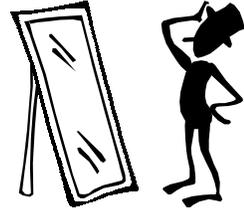
5. Conclusion

- Scientists draw conclusions by examining the data and graphs from the experiment.
- This is a final summary of an investigation or experiment that will be shared with others.

How to write an effective conclusion

Also known as putting it all together

What is in a conclusion?

- A conclusion is a summary of the experiment.
- It is putting the hypothesis together with the data and coming up with a conclusion or ending thought.
- It is a written answer to the original question.

So where to start…

- Every conclusion begins with a topic sentence.
- In a conclusion, the topic sentence is the restatement of the problem/question.

For your conclusion, you have to review your hypothesis..

★ Next: restate the hypothesis.
★ What was predicted?

So was your hypothesis right, wrong or indifferent?

Accept or reject your hypothesis
Does the data support the hypothesis?
If it does-we accept the hypothesis
If it doesn't-we reject the hypothesis

Now provide evidence

Provide actual data in sentence form that backs up your previous statement.

Next

- What type of relationship was there, if any?
  - How did the independent variable effect the dependent variable?
- Were there any trends (changes; increases, decreases in data) or patterns (repeated data that is similar) in the data?
- Discuss issues, problems or errors with the investigation.

Concluding sentence

- This sentence should
  - Begin with a transition word
    - To sum it up
    - Clearly
    - In conclusion
    - Obviously
  - Rephrase the original question or problem
  - Remind the reader why this was important.

Our conclusion outline

- Topic sentence: restate your problem/question
- Restate your hypothesis (It was predicted that...)
  - Accept or reject your hypothesis
    - Provide evidence
      - Actual data from the experiment showed
      - Relationships or trends in the data : Provide evidence
- Issues or problems with the investigation
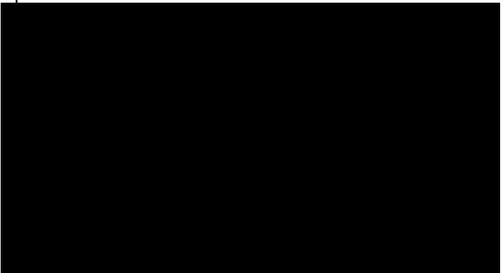- Wrap it up! Concluding sentence

Let's look at a scientific method study

RubberBands vs Watermelons
featuring the Slow Mo Guys

Think about it…

- Remembering the steps of the scientific method, with your group, you're going to develop a lab using rubber bands & a watermelon.
- Can you do it?